

**PCT**

From the INTERNATIONAL BUREAU

**NOTICE INFORMING THE APPLICANT OF THE  
COMMUNICATION OF THE INTERNATIONAL  
APPLICATION TO THE DESIGNATED OFFICES**

(PCT Rule 47.1(c), first sentence)

To:

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|   |  |   |
|---|--|---|
| Date of mailing (day/month/year)<br>10 August 2000 (10.08.00) |  |   |
| Applicant's or agent's file reference<br>LAM/99058235         |  | <b>IMPORTANT NOTICE</b>                                       |
| International application No.<br>PCT/SG00/00012               | International filing date (day/month/year)<br>31 January 2000 (31.01.00) | Priority date (day/month/year)<br>02 February 1999 (02.02.99) |
| Applicant<br>SINGAPORE POLYTECHNIC et al                      |  |   |

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:  
AU,JP,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:  
AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CU,CZ,DE,DK,EA,EE,EP,ES,FI,GB,GD,GE,GH,  
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The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on  
10 August 2000 (10.08.00) under No. WO 00/45980

**REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)**

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

**REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))**

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

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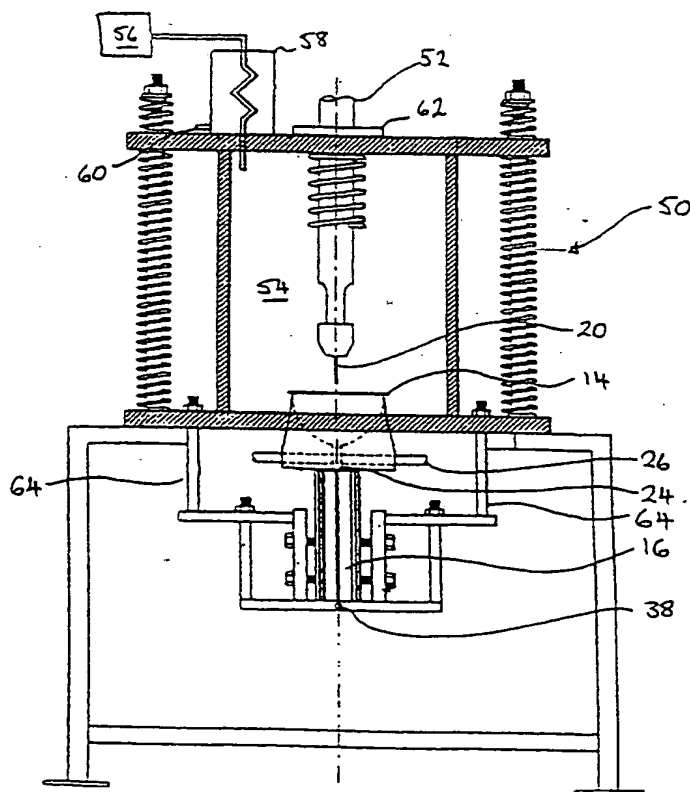
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

|  |   |  |
|--|---|--|
| (51) International Patent Classification <sup>7</sup> :<br><b>B22D 41/015, 41/62</b>   | <b>A1</b>   | (11) International Publication Number: <b>WO 00/45980</b><br>(43) International Publication Date: <b>10 August 2000 (10.08.00)</b> |
| <p>(21) International Application Number: <b>PCT/SG00/00012</b></p> <p>(22) International Filing Date: <b>31 January 2000 (31.01.00)</b></p> <p>(30) Priority Data:<br/><b>9900057-2</b>      <b>2 February 1999 (02.02.99)</b>      <b>SG</b></p> <p>(71) Applicant (for all designated States except US): <b>SINGAPORE POLYTECHNIC [SG/SG]; 500 Dover Road, Singapore 139651 (SG).</b></p> <p>(72) Inventor; and<br/>(75) Inventor/Applicant (for US only): <b>LOH, Peng, Chum [SG/SG]; 500 Dover Road, Singapore 139651 (SG).</b></p> <p>(74) Agent: <b>LEE, Ai, Ming; Rodyk &amp; Davidson, 9 Raffles Place, #55-01 Republic Plaza, Singapore 048619 (SG).</b></p> | <p>(81) Designated States: <b>AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</b></p> <p><b>Published</b><br/><i>With international search report.</i></p> |  |

(54) Title: METAL CASTING

## (57) Abstract

Metal casting apparatus (10) comprises a tungsten inert gas (TIG) hand torch (12), a graphite crucible (14) and a graphite mould (16). Energised by a high frequency alternating current by supply (30), the torch (12) produces a pulsating arc within an inert gas shield (22). The arc melts metal (28) in the crucible (14), and cleaning of the molten metal is achieved by superimposing a positive DC bias on the alternating current. Different metals may be alloyed, with homogeneity resulting from agitation and stirring the molten metal. The molten metal is poured into mould (16) through conduit (24) by opening tap rod (26).



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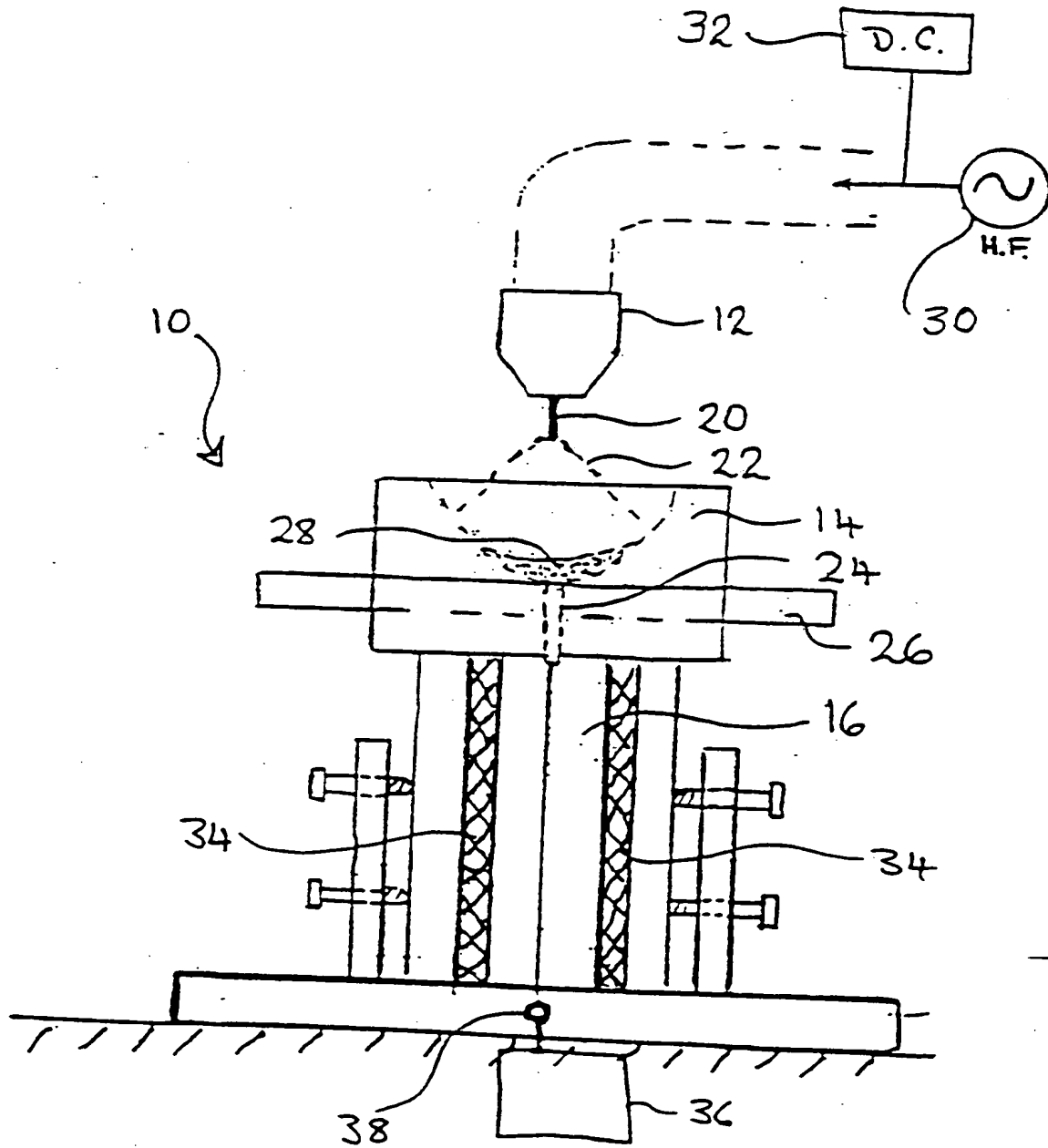


FIGURE 1

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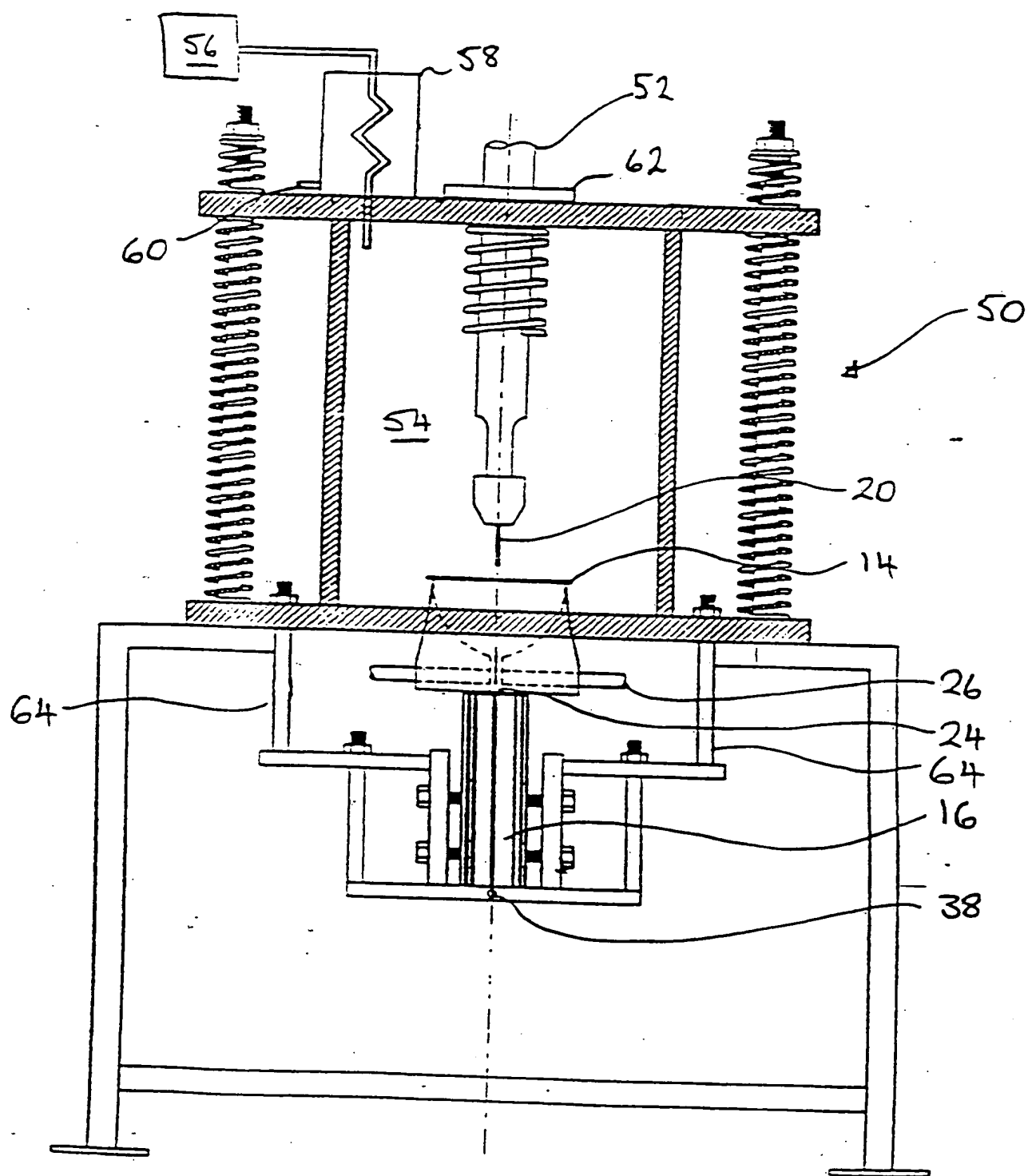


FIGURE 2

# INTERNATIONAL SEARCH REPORT

International application No.  
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| <b>A. CLASSIFICATION OF SUBJECT MATTER</b>   |  |   |  |   |   |  |   |  |  |   |  |  |
|--|--|---|--|---|---|--|---|--|--|---|--|--|
| Int. Cl. <sup>7</sup> : B22D 41/015, 41/62   |  |   |  |   |   |  |   |  |  |   |  |  |
| According to International Patent Classification (IPC) or to both national classification and IPC  |  |   |  |   |   |  |   |  |  |   |  |  |
| <b>B. FIELDS SEARCHED</b>  |  |   |  |   |   |  |   |  |  |   |  |  |
| Minimum documentation searched (classification system followed by classification symbols)<br>B22D 41/--, 1/00, 23/00, B01F/--  |  |   |  |   |   |  |   |  |  |   |  |  |
| Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched.   |  |   |  |   |   |  |   |  |  |   |  |  |
| Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)<br>dwpi : (electrod+ or arc), (stir+ or agit+ or mix+) & (crucibl+ or ladl+)  |  |   |  |   |   |  |   |  |  |   |  |  |
| <b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>  |  |   |  |   |   |  |   |  |  |   |  |  |
| Category*  | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No.   |  |   |   |  |   |  |  |   |  |  |
| X  | Patent Abstract of Japan, JP 63-144855 A (NIPPON KOKAN KK) 17 June 1988 & JP 63-144855 A   | 1-3, 6-8, 14-15, 18-19, 26  |  |   |   |  |   |  |  |   |  |  |
| X  | EP 18450 A1 (IWATANI SANGYO KK) 12 November 1980<br>See page 1 line 4, page 2 lines 26-28, page 4 lines 11-19, page 11 lines 9-12.   | 1-2, 10-14, 20-23, 27, 29-31  |  |   |   |  |   |  |  |   |  |  |
| X<br>Y   | GB 1035875 A (INTERNATIONAL BUSINESS MACHINES CORPORATION) 13 July 1966  | 1-5, 14-17, 24-26<br>6-7, 18  |  |   |   |  |   |  |  |   |  |  |
| X  | US 5846287 A (KUMAR et al.) 8 December 1998  | 1-3, 6, 14-15, 18   |  |   |   |  |   |  |  |   |  |  |
| <input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex  |  |   |  |   |   |  |   |  |  |   |  |  |
| <p>* Special categories of cited documents:</p> <table border="0"> <tr> <td>"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"E" earlier application or patent but published on or after the international filing date</td> <td>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td>"&amp;" document member of the same patent family</td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table> |  |   | "A" document defining the general state of the art which is not considered to be of particular relevance | "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention | "E" earlier application or patent but published on or after the international filing date | "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone | "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art | "O" document referring to an oral disclosure, use, exhibition or other means | "&" document member of the same patent family | "P" document published prior to the international filing date but later than the priority date claimed |  |
| "A" document defining the general state of the art which is not considered to be of particular relevance   | "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention  |   |  |   |   |  |   |  |  |   |  |  |
| "E" earlier application or patent but published on or after the international filing date  | "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone   |   |  |   |   |  |   |  |  |   |  |  |
| "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)  | "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |   |  |   |   |  |   |  |  |   |  |  |
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| Date of the actual completion of the international search<br>15 May 2000   |  | Date of mailing of the international search report<br>24 MAY 2000     |  |   |   |  |   |  |  |   |  |  |
| Name and mailing address of the ISA/AU<br>AUSTRALIAN PATENT OFFICE<br>PO BOX 200, WODEN ACT 2606, AUSTRALIA<br>E-mail address: pct@ipaustalia.gov.au<br>Facsimile No. (02) 6285 3929   |  | Authorized officer<br><br>R.P. ALLEN<br>Telephone No : (02) 6283 2134 |  |   |   |  |   |  |  |   |  |  |

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/SG00/00012

| C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT |   |                                    |
|---|---|------------------------------------|
| Category*   | Citation of document, with indication, where appropriate, of the relevant passages                              | Relevant to claim No.              |
| X   | US 4670884 A (LETIZIA et al.) 2 June 1987<br>See column 1 lines 13-19, column 2 lines 11-17.                    | 1-5, 14-18                         |
| X<br>Y  | US 3683094 A (SCHLIENGER) 8 August 1972<br>See abstract, figure 1.  | 1-5, 14-17<br>6-7, 18              |
| X<br>Y  | US 4700769 A (OHARA et al.) 20 October 1987<br>See column 4 lines 8-31, Figure 4.                               | 1-5, 14-17<br>6-7, 18              |
| X   | Derwent Abstract Accession No. 18928W/11, Class M24, RU 429099 A,<br>(CHELYABINSK METALLURG WK) 15 October 1974 | 1-5, 14-17<br>-                    |
| X<br>Y  | US 4110546 A (STENKVIST) 29 August 1978   | 1-4, 14-16<br>6-7, 18              |
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| X   | Patent Abstract of Japan, JP 56-151162 A (NAKASEKO ISAO) 24 November 1981<br>See abstract and figures.          | 1-2, 5, 14, 26                     |
| Y   | US 4572673 A (PORTER et al.) 25 February 1986   | 6-7, 18                            |
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| P,X   | US 5956366 A (SHIMIZU et al.) 21 September 1999   | 1-3, 14-15,<br>26                  |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.  
PCT/SG00/00012

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

| Patent Document Cited in Search Report |         |      |          | Patent Family Member |          |    |         |
|--|---------|------|----------|----------------------|----------|----|---------|
| US                                     | 5846287 | AU   | 74091/94 | CN                   | 1128546  | EP | 713537  |
|  |         | US   | 5411611  | WO                   | 9504836  |    |         |
| US                                     | 4670884 | EP   | 183654   | IT                   | 1208697  |    |         |
| US                                     | 3683094 | NONE |          |                      |          |    |         |
| US                                     | 4700769 | NONE |          |                      |          |    |         |
| US                                     | 4110546 | DE   | 2648575  | FR                   | 2331233  | GB | 1557571 |
|  |         | JP   | 52060455 | JP                   | 61001990 | SE | 7512428 |
| US                                     | 5168917 | DE   | 4116071  | FR                   | 2662072  | GB | 2244020 |
|  |         | JP   | 4022564  |                      |          |    |         |
| US                                     | 4572673 | BR   | 8300696  | CA                   | 1220622  | EP | 86637   |
|  |         | ES   | 519736   | ES                   | 8405654  | GB | 2114907 |
|  |         | IN   | 158301   | JP                   | 58199651 | ZA | 8300844 |
| US                                     | 5963579 | BR   | 9803140  | CA                   | 2243523  | EP | 897770  |
|  |         | FR   | 2767081  |                      |          |    |         |
| US                                     | 5956366 | NONE |          |                      |          |    |         |
| END OF ANNEX                           |         |      |          |                      |          |    |         |